

INSTRUCTIONAL METHODS FOR NEUROSCIENCE IN NURSE ANESTHESIA GRADUATE  
PROGRAMS: A SURVEY OF EDUCATIONAL PROGRAMS

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## ABSTRACT

Advanced neuroscience instruction is a requirement for certification as a nurse anesthetist. The importance of learning neuroscience for the nurse anesthetist is reflected through the required hours determined by the Council of Accreditation of Nurse Anesthesia Educational Programs. Thirty percent of the certification examination relates to neuroscience. There are currently no studies in the literature describing instructional methods in neuroscience for nurse anesthesia programs. This study provides a descriptive analysis on how neuroscience is taught in accredited nurse anesthesia programs. A survey consisting of 29 questions regarding neuroscience course curriculum was mailed to the nurse anesthesia programs (n=83) accredited by the Council on Accreditation. Supporting evidence for content validity and reliability was obtained prior to the mailing. A total of 54 programs (64%) responded to the survey. The majority of the programs (51%) teach a specific course in neuroscience. The mean number of semester hours was (3.6 hours). The mean hours spent in lecture was 5 hours per week. The mean hours spent in the laboratory was 1 hour. Variability existed in the methods used for instruction. Textbooks were used on the average 33 % of the time teaching neuroscience. Lectures were used on the average 47 % of the time to teach neuroscience. Computer-aided instruction was used approximately 1% of the time to teach neuroscience. Clinical experience accounted for 10% of the instruction time to teach neuroscience. Laboratory time accounted for 1% and other for 2% of the time.

Key words: nurse anesthesia, neuroscience instruction, curriculum

INSTRUCTIONAL METHODS FOR NEUROSCIENCE IN NURSE ANESTHESIA GRADUATE  
PROGRAMS: A SURVEY OF EDUCATIONAL PROGRAMS

by

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THESIS

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## PREFACE

This research was conducted to provide information on the instruction of neuroscience to graduate student nurse anesthetists (SRNA's). Through the use of a validated questionnaire, it was designed to describe how neuroscience is taught in accredited nurse anesthesia programs. The results could be used as a means of comparing and evaluating various teaching methods that are used to teach neuroscience.

#### DEDICATION

I would like to dedicate the creation of this thesis to my wife Beckie who without her love, support and encouragement the creation of this thesis would not have been possible.

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## CHAPTER I: INTRODUCTION

## Background

Surgeons, who handpicked individuals to train as their private anesthetist, provided the first opportunities for nurses to educate themselves in the basic neurological sciences. The surgeons used readings, discussions, laboratories and finally clinical experiences as teaching methods. The widespread use and acceptance of trained nurses in anesthesia lead to hospital-based educational curricula (Gunn, 1991). In 1909, the first formal educational programs preparing nurse anesthetists were established. According to Bankert (1993), the first schools of anesthesia concentrated their studies on neuroscience, including medical and respiratory physiology, anatomy, and pharmacology. Neuroscience is the study of the structure, development and function of the nervous system requiring an understanding and knowledge from many other fields of the basic sciences including anatomy, physiology, chemistry and psychology ([www.usuhs.mil/neuro/neuro.html#NS](http://www.usuhs.mil/neuro/neuro.html#NS)). After World War I, nurse anesthesia programs moved into university hospitals and community medical centers. These medical centers paved the way for anesthetists to become trained as graduate students. However, there was no approving authority or association for setting standards.

Due to their expanded knowledge of the basic sciences and technical skills, nurse anesthetists were the initial autonomous practitioners of nursing. Yet, from their historic beginnings, they were indoctrinated that they were practicing a medical specialty. This resulted in their loss of contact with an organized group of nursing. Since nurse anesthetists and the rest of the nursing profession were

not communicating, anesthetists were left behind in the trend to move nursing education to a university setting graduate school specialty (Merz, 1984).

In the 1920s, the American Nurses Association refused to set up separate section for nurse anesthetists within its organization. This dispute lasted for years and in 1931, led to the creation of the National Association of Nurse Anesthetists (NANA). In 1934, the NANA agreed to a standardized curriculum for educational programs. This curriculum required the study of neuroscience and set the standards needed for credentialing and certifying nurse anesthetists (Gunn, 1991). In 1939, the NANA became the American Association of Nurse Anesthetists (AANA), which adopted plans to inspect programs and have a national certifying examination. In 1975, the Council on Accreditation (COA) was developed to function as an autonomous multi-disciplinary body under the auspices of the AANA (AANA, 1996). The COA of Nurse Anesthesia Educational Programs accredits Nurse Anesthesia education programs throughout the United States.

The importance of learning neuroscience for the nurse anesthetist today is reflected through the required hours determined by COA of Nurse Anesthesia Educational Programs (AANA 1998). The minimum curriculum to graduate from an accredited program requires studies in physiology, pharmacology and anatomy. According to Finger (1994), physiology, anatomy and pharmacology are the basic foundational studies in neuroscience.

In order that nurse anesthesia educational programs meet COA requirements for accreditation, they must meet current academic guidelines and standards. According to Foster and Jordan (1994) the

current requirements for didactic course work include:

1. Professional aspects of nurse anesthesia practice (45 hours)
2. Advanced anatomy, physiology, and pathophysiology (135 hours)
3. Chemistry and Physics Related to Anesthesia (45 hours)
4. Advanced Pharmacology (90 hours)
5. Principles of Anesthesia Practice (90 hours)
6. Clinical and Literature Review Conferences (45 hours)

The COA is recognized by the United States Department of Education and the Council on Postsecondary Education Accreditation (COPA) as the sole accrediting authority for nurse anesthesia programs. Recognition from COPA is important because it validates the quality of the nurse anesthesia program (Burnette, 1997).

The educational preparation of Certified Registered Nurse Anesthetists (CRNAs) is conducted in approximately 90 accredited programs throughout the United States. Currently, more than half of the programs are at the master's level and all require courses in the basics of neuroscience (AANA, 1996). However, there are no studies that describe the methods used to teach these courses.

The Graduate Nurse Anesthesia program at the Uniformed Services University of the Health Sciences (USUHS) began in 1994 with the first class graduating in 1996. This program requires two courses introducing the nervous system, Neuroscience I and Neuroscience II. They focuses on anatomy, physiology and cellular biology as they relate to the nervous system. From the initial COA accreditation in 1994, these courses were described as innovative, unique and important to learning the nervous system (D. Rigamonti PhD, personal communication,

December 5, 1998).

Taught simultaneously with the Human Anatomy course, the neuroscience courses clinically orient the students using dissection, prosection, computer-assisted instruction and lectures to learn and understand the human nervous system. The courses are taught and supervised by a Ph.D. level neuroscientist/anatomist with the help of instructors including nurse anesthetists, physicians, biologists, and physiologists.

The COA of Nurse Anesthesia Educational Programs determines the criteria programs must meet to be accredited. It does not, however, dictate how this information must be taught to the students. Therefore, there are distinct differences how it is taught which set some educational programs apart from others (Carroll-Perez, 1996). For example, some programs choose not to teach a formal class in neuroscience but instead incorporate this information into other classes or courses.

The Council on Certification of Nurse Anesthetists (CCNA) expects every student nurse anesthetist to become knowledgeable on the basics of neuroscience. Thirty percent of the certification exam for nurse anesthetists is related to neuroscience.

#### Purpose of the Study

The purpose of this study was to describe how neuroscience is taught and incorporated into nurse anesthesia curricula. This study provided the information and a database to illustrate the scope, depth, and significance of neuroscience in curricula of graduate nurse anesthesia programs. It provided the means of comparing how neuroscience is taught at the Uniformed Services University of the

Health Sciences (USUHS) to other nurse anesthesia programs. The data collected from this study can be utilized in future studies to determine if the teaching methods used make a difference in the way anesthetists learn neuroscience.

Nurse anesthetists daily manipulate the nervous system. The technical procedure performed and drugs given, require extensive knowledge of the nervous system to deliver care in a safe and competent manner. There have been no studies of nurse anesthesia programs and curricula related to the study of neuroscience. Since neuroscience is a required element in becoming a safe, competent and certified nurse anesthetist, it is important to describe how it is being taught and whether these methods are effective.

#### Research Questions

In an attempt to establish how accredited nurse anesthesia programs teach neuroscience, this study sought to answer the following questions:

1. How many of the currently accredited nurse anesthesia programs teach a specific course on neuroscience?
2. What are the instructional methods employed to teach neuroscience at the various schools?

#### Conceptual/Theoretical Framework

##### Adult Learning Theory

The education literature suggests that students who are actively engaged in the learning process will be more likely to achieve success (<http://www.cybercorp.net/~tammy/lo/oned2.html>). Once students are actively engaged in their own learning process they begin to feel empowered and their personal achievement and self-direction levels

rise. According to Sims and Sims (1995) adult learning is about change in attitude, change in knowledge, change in behavior, change in a skill, and change in how we think about things. Garde (1996) states that adults come to the learning arena with an array of experiences and lifelong constructed knowledge. He also states that nurse education programs should build on prior nursing experience and education. Part of being an effective learner involves understanding how adults learn. Compared to children and teens, adults have special needs and requirements as learners.

Dr. Malcolm Knowles (1990), lecturer and author in the field of adult education, coined the terms andragogy and pedagogy. Andragogy refers to the art and science of helping adults learn while pedagogy has been used to describe the art and science of teaching children (<http://www.sil.org/lingualinks/library/literacy/glossary/cjJ227/vao1613.htm>). Knowles theory of andragogy (adult learning) is an attempt to differentiate the way adults learn from the way children learn. Cranton (1992) states that the basic principle behind andragogy is that adults learn differently from children. We must be cognizant of this when applying learning techniques to educational programs for adults.

Knowles (1990) who pioneered the field of adult learning, defines five assumptions, all of which are characteristics of adult learners:

1. As a person matures, his or her self-concept moves from that of a dependent personality toward one of a self-directed human being.
2. An adult accumulates a growing reservoir of experience, which is a rich resource for learning.
3. The readiness of an adult to learn is closely related to the development tasks of his or her social role.

4. There is a change in time perspective as people mature - from future application of knowledge to immediacy of application. Thus, an adult is more problem-centered in learning.

5. Adults are motivated to learn by internal factors rather than external ones.

Kearsley (1996) summarizes what andragogy means to instructors in practical terms. Andragogy means that instruction for adults needs to focus more on the process and less on the content being taught.

Strategies such as case studies, role-playing, simulations, and self-evaluations are most useful. Instructors should adopt a role of facilitator or resource rather than lecturer or grader. Reinforcement and the need to recognize the uniqueness of adult learners encourage the design, delivery, and evaluation of curricula to address adults unique learning characteristics. Adult learners look for relevancy in the subject matter. The course information must be relevant to their work-setting or life responsibilities and be of value to them. Adults are also practical and focus on aspects of a lesson most useful to them in their work. According to Cantor (1992), instructors should not take for granted that adult learners are interested in knowledge for its own sake and therefore must assure learners that the information will be useful to them.

Adult education, like children's education, has fallen victim to teacher-centered models. In 1926, influenced by educator Eduard C. Lindeman (1926), the American Association for Adult Education began and quickly started researching better ways to educate adults through self-directed learning. According to Tuijnman (1992), our academic system since then has grown in reverse order where subjects and teachers

constitute the starting point and learners are secondary. In conventional education today, the learner is required to adjust himself to an established curricula.

Lindeman (1926) states that too much of learning consists of vicarious substitution of someone else's experience and knowledge. A century after Lindeman proposed learner-focused education, most formal education still focuses on the teacher. Therefore, many learners leave school having lost interest in learning. According to Cantor (1992), even good-intentioned educators can squelch naturally inquisitive instincts by controlling the learning environment. By adulthood, some people view learning as a chore and a burden. In the information age, the implications of a move from teacher-centered to learner-centered education are staggering. Postponing or suppressing this move will slow our ability to learn new technology and gain the competitive advantage.

#### Definition of Terms

##### American Association of Nurse Anesthetists (AANA)

The professional association of Certified Registered Nurse Anesthetists. The philosophy of the professional organization is that the members are dedicated and committed to the advancement of educational standards and practices, which will advance the art and science of anesthesiology and thereby support and enhance quality patient care (AANA Bylaws, 1987).

##### Certified Registered Nurse Anesthetist (CRNA)

A registered nurse who is educationally prepared and competent to engage in the practice of nurse anesthesiology, responsible and accountable for individual professional practice, and capable of

exercising independent judgement within their scope of practice (Foster & Jordan, 1994).

Computer Assisted Instruction (CAI)

The use of computers to simulate a three dimensional view of the brain and nervous system.

Council on Accreditation (COA)

The accreditation agency for all educational nurse anesthesia graduate programs in the United States (Wiseman, 1990).

Council on Postsecondary Education Accreditation (COPA)

A national, nonprofit, non-governmental agency dedicated to the improvement of postsecondary education in the United States through voluntary accreditation. This council reviews the accreditation practices of schools desiring recognition by COPA through periodic review (Wiseman, 1990).

Dissection

To separate tissues and parts of a cadaver (corpse) or an organ for anatomical study (Tortora, 1983).

Prosection

A previously dissected cadaver, preserved and used for examination and instruction.

Neuroscience

Neuroscience is the study of the structure, development and function of the nervous system requiring an understanding and knowledge from many other fields of the basic sciences including anatomy, physiology, chemistry and psychology  
([www.usuhs.mil/neuro/neuro.html#NS](http://www.usuhs.mil/neuro/neuro.html#NS)).

#### Assumptions and Limitations

This research project assumes that there is variability in how nurse anesthetists are being taught neuroscience in the various accredited nurse anesthesia schools in the United States. This study will be limited to nurse anesthesia schools, which are accredited and meet the standards and guidelines of the COA. The number of schools that are willing to participate in the survey and self-report through a questionnaire will also limit this study. Lastly, inherent limitations of any descriptive study must be considered.

## CHAPTER II: REVIEW OF LITERATURE

This chapter will present a historical overview of neuroscience, followed by a discussion of neuroscience in health science curricula. Finally, a review of adult learning methods including computer-assisted instruction as a teaching method will be addressed.

## Overview

The Egyptians were the first to provide systematic medical records in writing. The Edwin Smith Surgical Papyrus stands out as being the earliest and perhaps the most descriptive ancient written record that deals with the effects of brain injuries. The Edwin Smith surgical papyrus was written about 1700 BC but is based on writings of the Old Kingdom (2640 BC). Now in the library of the New York Academy of Medicine, it contains some reference to head injuries. The descriptions revealed that early Egyptians were aware that symptoms of central nervous system injuries could occur far from the locus of damage. There were examples of injuries that caused deficits on the opposite side of the body. There were also examples of injuries that caused problems in eye-hand coordination (Finger, 1994).

The most significant physician of the ancient world after Hippocrates, Galen (130-200 A.D.), achieved great fame throughout the Roman Empire. In 161, Galen traveled to Rome, where he soon earned a reputation as an outstanding healer. This afforded Galen the opportunity to study and write. His more than 400 treatises were on subjects, ranging from philosophy to drama. His medical writings showed penetrating and often accurate observations on human anatomy, including the nervous system. He established the standard of dissecting, doing many dissections on apes, swine and dogs. Some of

his best dissections were on brains and spinal cords. He named and differentiated the meninges, ventricles, corpus callosum, pituitary gland, fornix and the sympathetic ganglia (McHenry, 1969). Not only did Galen describe neuroanatomical structures, he was also responsible for describing the cervical, brachial and lumbosacral plexuses. Galen also was the first to classify the cranial nerves, although he was inaccurate regarding specific functions and the total number (Meyer, 1971).

Andreas Vesalius (1514-1564) was a Belgian anatomist and physician whose dissections of the human body and descriptions of his findings helped to correct some misconceptions prevailing since ancient times. In Paris he studied medicine and developed an interest in anatomy. During his research, Vesalius showed that the anatomical teachings of Galen, revered in medical schools, were based upon the dissections of animals, although they were meant as a guide to the human body. Between 1536 and 1562 while teaching at Padua, Vesalius wrote and published six medical works. His fame and importance for posterity, however, are based mainly on his *De Humani Corporis Fabrica Libri Septem*, a 700-page folio and *The Epitome* which were both published in Basel in 1543, with 323 woodcuts taken from drawings by Stefaan van Calcar on instructions from Vesalius. These masterpieces of firsthand observation laid the foundations for the modern science of anatomy (<http://weber.u.washington.edu/~cabal/main/vesalius.html>).

The English anatomist, Thomas Willis (1621-1675), produced the best pictures of the brain available in the 1600 s. He showed that the folds of the cerebral cortex covered a certain number of subcortical centers, such as the striatum, the thalamus and the corpus callosum.

He distinguished a cortical grey matter, responsible, in his mind, for animal spirits, from a deeper white matter, responsible for distributing the spirits to the rest of the organism, to which they give sensation and movement. Willis still accepted the idea of an immaterial, reasoning soul unique to man, somewhere beyond the blade of his scalpel (Changeux, 1985). Willis distinguished some of the subcortical centers, such as the thalamus and the striatum. He showed the corpus callosum linking the two hemispheres, and he distinguished the white matter of the deeper areas from the grey matter of the cortex. He also delineated eight major pairs of nerves at the base of the brain, including the optic nerves, the smell nerves and the nerves that control the movements of the eyes (Willis 1681). Thomas Willis assigned the function of linking the mind to the brain to the striatum. He was also one of the last of the animal spirit theorists (along with Descartes). He carried out experiments showing that if the blood was prevented from reaching the brain then "nerve function ceased because vital spirits could not reach the ventricles for conversion into the essential animal spirits" (Stevens 1971, p.13).

Vicq d Azyr of France (1748-1794) was educated in his native land. Early in his career he determined that he would be a neuroanatomist and his treatises helped lay the foundation for neuroanatomy. He was one of the first to section the brain horizontally. He is credited with rediscovering the white line in the visual cortex. He created one of classic anatomic folios of the brain. By fixing the brain in alcohol he demonstrated ease in dissection. He identified for the first time many of the cerebral convolutions, as well as the deep gray nuclei of the cerebrum and basal ganglia. The mamillothalamic tract was also

described by him and bears his name. During his life, his atlas is one of the finest available in neurological literature (Critchley, Rose, & Bynum, 1982).

Dr. Charles Bell (1774-1842) established that the nerves of the special senses could be traced from specific areas of the brain to their end organs. He clearly demonstrated that spinal nerves carry both sensory and motor functions and that sensory fibers traverse the posterior roots whereas the motor fibers run through the anterior horn (Bell's Law). Bell also demonstrated that cranial nerve V was sensory to the face and motor to mastication whereas cranial nerve VII controlled muscles of expression. The eponyms of the respiratory nerve of Bell and Bell's Palsy perpetuate his name (McHenry, 1969).

Dr. James Parkinson (1755-1828) was born in London, and in his early education studied Latin, Greek, natural philosophy and shorthand. He considered all as proper basic tools for a physician. Early on he assisted and then took over the practice of his father in general medicine. He wrote a little known medical monograph on "Observations on the Nature and Cure of Gout" in 1805. However, his "ESSAY ON THE SHAKING Palsy" published in 1817 gained him immortality in the annals of Medicine (Finger, 1994).

Dr. Paul Broca (1824-1880) at the tender age of 17, started his monumental life as a prosector. He eventually became Secretary of the French Society -Anatomique. As a neurological clinician and also as a researcher, he wrote effusively- well over 500 presentations. A classic 900-page monograph on aneurysms came forth from his gifted pen and he even experimented with hypnotism in a series of surgical cases. Even with considerable opposition, he helped introduce the microscope

in the diagnosis of cancer. Nevertheless, he is best known, amongst so many other accomplishments, for his contribution to neurology and the concept of functional localization by cerebral convolution. With his aged father looking on with silent admiration, he demonstrated the brain lesion of his first patient who had suffered from aph mie (renamed aphasia later by Armand Trousseau (1801-1867). From this presentation and from other ongoing observations he concluded that the integrity of the left frontal convolution was responsible and necessary for articulate speech. David Ferrin (1843-1928) is responsible for naming this region Broca's convolution- the motor speech area. (Berker, Berker, & Smith, 1986).

Dr. Carl Wernicke (1848-1904) was born in Tarnovitz, Poland but his family moved to Germany where he received all his education. Interested in psychiatry, traditionally he studied anatomy initially and neuropathology later. He published a small volume on aphasia, which vaulted him into international fame. In it, he correlated the pathological/anatomical lesions paralleling the clinical picture. He is best known for his work on sensory aphasia and poliomyelitis hemorrhagia superior. Both of these descriptions bear his name. Further, his books on the disorders of the internal capsule and his textbooks on diseases of the nervous system perpetuate him (<http://www-lj.eb.com:82/index.html/aDB/articles>). By this time, the cerebral cortex had been divided up into multiple regions based on regional variations in its cellular or fiber structure. The more lasting of these cortical architectural parcels were those defined by Korbinian Brodmann (1868-1918) who created the numbering and lettering schemes, that are still in use. However, in spite of having been given labels,

the functions of vast regions of the cortex, other than the primary sensory and motor areas, remained mysterious. These regions were termed association cortices initially because they were thought to be the site of associations among the sensory and motor areas (Finger, 1994).

#### Neuroscience in Health Science Curricula

During the nineteenth century, a surge in neuroscience discoveries and the advent of medical specialization led to new educational demands for postgraduate neurological training in the United States. However, the literature on neuroscience training is limited to schools of medicine and physical therapy. The information on the teaching of neuroscience in other health care curricula, including nursing, is extremely limited.

The majority of the literature agrees that the design features for neuroscience courses should fit specific educational objectives. These objectives should include basic neuroscience combined with clinical neuroscience. Unfortunately, most medical schools retain the traditional format of undergraduate education, separating preclinical and clinical years. This results in basic and clinical neuroscience being taught in isolation from one another (Gledhill, 1987). Pappert (1995) stated that up until the mid-nineteenth century, neuroscience undergraduate medical training was nonexistent and what was taught was presented in the context of internal medicine. During the second half of the nineteenth century, medicine developed a neurological consciousness due to the growth of neurological knowledge at the time. This knowledge led to neurological preceptorships fostering both laboratory and clinical training. General postgraduate medical

training with optional neurological focus and independent neurological schools soon followed. Gledhill (1987) stated that the most effective way to learn neuroscience is through the use of clinical skills involving a period of full-time residential assignment. However, most medical students still gain their neurological clinical experience during their assignment to the services of internal medicine. As neuroscience education moves into the next century, clinical relevance will continue to play a major role. Today, the clinical anatomicist/neuroscientist is becoming a more active participant in clinical activities (Putz, 1993).

Griffiths, Bevil, O Conner, and Wieland (1995) suggested that undergraduate nursing students who were successful in undergraduate physiology and anatomy classes performed better in nursing school as a whole. In a study of physical therapy programs by Mattingly and Barnes (1994), the researchers found that there were many differences among other allied health curricula regarding the methods being used to teach neuroscience and anatomy. They also found that a variety of different books and teaching methods were being used, and that clinical applicability of content was a major consideration. Their survey requested information about instructors qualifications, student numbers and ratios, instructional activities and course content.

#### Use of Computer-Assisted Instruction in Neuroscience Curricula

The past 10 years have seen efforts by many educational institutions to make use of the benefits of today's powerful computers for teaching. The current literature reflects and suggests that new tactics be developed to incorporate the large and ever growing body of knowledge in the field of medicine. The proliferation of computer

applications supporting medical education suggests that computer technology is having a significant impact on medical education curricula (Longstaffe, 1996).

The traditional educational approaches such as lectures, overhead projections, slides, and blackboard instruction are time consuming for the instructor. Students often become frustrated and have a difficult time internalizing and retaining neurological concepts when presented in the traditional method. Adult-centered educators have suggested that teaching methods should promote active learning and should be student centered.

A study by Teyler and Voneida (1992), identified two areas in neuroscience that are difficult for students to master. The first area is the geometric anatomy of the central nervous system structures and their anatomic relationship towards each other. The second area is that of time-varying phenomenon in neurophysiology as it relates to ion fluxes and biochemical cascades. Tan, Voon and Rajendran (1989) concluded that teaching neuroscience by computers promotes an active, self-directed learning environment without adversely affecting the overall performance of students.

The computer programs, software, and extensive amount of disk space available today allow advanced graphics applications to be used to their full potential. There are many programs available for neuroscience instruction. Pradham and Dev (1993) suggest that computer-assisted instruction effectively communicates visual images with their conveyance of spatial and temporal dimensions. However, their study showed that exposing students to computer-assisted instruction (CAI) does not change their problem solving approach, or

conceptual organization to learning. Lamperti and Sodicoff (1997) concluded that computer-aided instruction made the students more interactive with each other while fostering independence and group learning. In addition, the students obtained a rapid comprehension of laboratory material with the help of a computer. Teyler and Voneida (1992) reported that the use of computer-based instruction resulted in a better mastery of neuroscience. When compared to the previous years scores, students in their study scored higher (from a previous 3-yr average of 73.5% correct to 80.1% correct) than in years past. Kulik and Kulik s (1991) research indicated that students learned one-third more material faster by using computer-based instruction than when taught by conventional means.

Computers have successfully retained and enhanced the dynamics of student-faculty discussion groups and facilitated collaborative learning among students themselves. Integrating computer technology into neuroscience instruction is becoming the rule rather than the exception.

### Summary

There have been numerous studies examining the educational content of graduate nurse anesthesia programs, however there have been no studies examining the content and teaching methods used in neuroscience curriculum for nurse anesthesia students. An important part of nurse anesthesia practice is the understanding and the integration of neuroscience to clinical practice. This study will attempt to examine the educational content used in neuroscience curricula in graduate nurse anesthesia programs. The results may provide information for future educators and nurse anesthetists.

## CHAPTER III: METHODS

## Introduction

This chapter will outline the methods used to implement this descriptive study. It will address the research design, sample selection and instrumentation including questionnaire development, content validity and test-retest reliability measurement. Protection of human rights and plans for data analysis will also be discussed.

## Research Design and Procedures

This study used a descriptive research design to explore how accredited nurse anesthesia educational programs incorporate neuroscience into their curricula. A cover letter of intent indicating the purpose of the study, along with a request that a contact person responsible for teaching neuroscience respond to the survey was mailed. Prior to mailing the survey, telephone interviews were conducted with ten nurse anesthesia program directors polling them informally about the survey questionnaire content. The intent was to assure that the questionnaire has relevance and is comprehensive. The final survey questionnaire was sent to all accredited programs, along with a self-addressed stamped envelope to increase the rate of return. A follow-up post card was sent two weeks after the original mailing to increase returns.

## Sample

The sample for this study consisted of all the accredited Graduate Nurse Anesthesia programs recognized by the Council on Accreditation (COA). At the time the surveys were sent there were 84 COA accredited schools from 34 states including Puerto Rico. There were 83 surveys sent, omitting the Uniformed Services University of the Health

Sciences.

#### Measurement

A thorough review of the literature revealed that this type of study had not been performed. The instrument, a questionnaire was developed involving several steps to provide estimates of reliability and validity. The Council of Certification of Nurse Anesthetists provides a topical outline to assist candidates in preparing for the examination (Appendix F). Approximately 30% of the examination is related to neuroscience. The survey consists of 29 questions focusing on the suggested topics related to neuroscience.

The survey was created with the assistance of randomly chosen program directors. Each program was given a number and chosen randomly from numbered paper. Ten percent of the total number of program directors were questioned over the telephone. While reviewing the CCNA outline, topics were extracted that were considered related to neuroscience. These same program directors were also questioned on their teaching methods for neuroscience. There was 98% agreement that they used textbooks, lectures, computers, clinical experience and laboratory. These factors were used in the creation of the questionnaire.

Estimates of content validity (Appendix A) were obtained by requesting that two practicing nurse anesthetists rate the relevancy of the information in the questionnaire. A Content Validity Index (CVI) score was determined using evaluation criteria with a one to seven (1= not important at all; 7=extremely important) rating scale for each question asked. A Content Validity Index (CVI) score of 1.0 was calculated based on the ratings of the two experts, therefore the tool

was left unchanged. To obtain estimates of stability of responses over time a random selection of 20 percent of the schools were sent the questionnaire. The expectation was that 50% of these will respond, representing approximately 10% (n=9) of the total number of accredited programs. The first 9 schools that replied were sent the survey again to determine the consistency among the responses. The first 9 respondents were chosen and sent the identical survey three weeks after the initial survey was received to establish test-retest reliability (Appendix C). A 60% return rate of the second survey was obtained and a percent agreement between the responses on the two test were calculated. An average of 90% agreement was calculated. Disagreements between the test-retest were all in instructions regarding section three of the survey. The instruction section of the survey was re-evaluated and changed slightly. Due to the high percentage of agreement between consecutive surveys in other sections, no other changes were made.

The final questionnaire (Appendix E) consisted of 29 questions in 5 sections. Section 1 relates to demographic data. Section 2 is questions specific to programs that teach neuroscience and section 3 reflects teaching methods specific to neuroscience. Section 4 asks the participant to rate the importance of physiological systems and section 5 asks to provide any additional comments. A cover letter explaining the study (Appendix B), with instructions (Appendix D) along with a self-addressed stamped envelope accompanied each questionnaire. An identification number was placed on the corner of each questionnaire to assist with data entry and follow-up on those who did not respond to the survey. Each school was assured that their confidentiality would

be maintained. Every attempt was made to include every school for a thorough representation of the data. Schools who did not respond were called and a total of five questionnaires were resent. A total of 56 (67%) schools from 34 states responded to the survey. Each item of the questionnaire was coded and the data were entered into a computer for analyzation via the Statistical Package for the Social Sciences (SPSS) Software Program.

#### Protection of Human Rights

This study did not involve human subjects or a hospital environment. Data was collected with a survey questionnaire. Response to the survey indicated consent. Respondents were assured that their responses would be reported in aggregate only and that no individual program would be identified. The protocol was approved by the USUHS investigational review board (IRB) and approved expeditately (Appendix G) .

## Chapter IV: DATA ANALYSIS

### Introduction

This chapter will describe the data obtained from the questionnaires that were sent to the 83 accredited nurse anesthesia schools. The questionnaires were sent to all COA accredited programs and completed by the program director.

Areas discussed were demographic data including the number of students in the program, program affiliation, geographic location and the educational backgrounds of the institutions instructors. Using the Council on Certification of Nurse Anesthetists (CCNA) recommended study guidelines related to neuroscience, instructional methods were analyzed in percentages. Each program was also asked to rate the importance of all tested bodily systems from 1-8 (1=most important to 2=least important). Lastly, a section was left for each participant to freely express any comments they felt would be useful.

### Demographic Data

Section 1 of the questionnaire asks three questions regarding demographic data and one question regarding the instructors educational preparation. Figure 1 represents the number of students that were enrolled in the program. Twenty-four schools (43%) enrolled 21-30 students. Sixteen schools (29%) enrolled 11-20 students. Ten schools (18%) enrolled 40 or more students and 3 schools (5%) enrolled 31-40 students and 1-10 students respectively.

#### Number of Students Enrolled in Nurse Anesthesia Graduate

#### Programs

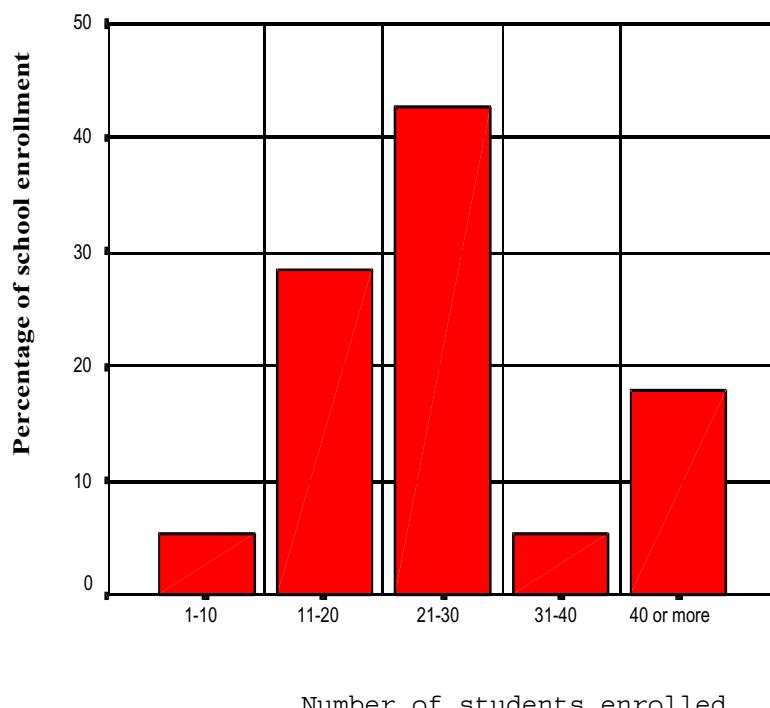


Figure 1.

The educational programs affiliation with a private hospital, university/university hospital setting or other was asked. Thirty-one schools (55%) were affiliated with a university. Eleven (20%) schools were affiliated with a private hospital and fourteen (25%) of the schools responded to other. Of the 14 other responses, six wrote in a combination of private and university setting, four replied as privately owned colleges, three as public hospitals and 1 as a free standing school.

Twenty-two (39%) of the respondents are from the East/East Coast. Eighteen (32%) of the respondents are from the Midwest. Ten (18%) of the respondents are from the South/Southwest. Three (5%) of the respondents are from the West/West Coast and three (5%) of the respondents are from the North/Northwest.

#### Research Question # 1

The first research question of this study is How many of the currently accredited nurse anesthesia programs teach a specific course on neuroscience?

It was found that 28 (50%) of the 56 respondents taught a specific course in Neuroscience. The remainder of the respondents 28 (50%), incorporated neuroscience into other Basic Science Foundation courses such as Pathophysiology, Advanced Anesthesia Courses, Pharmacology and Human Anatomy.

#### Research Question # 2

The second research question was What are the instructional methods employed to teach neuroscience at the various schools ? This question encompasses the remainder of the data obtained from the questionnaire. Textbooks used, contact hours, who taught the

neuroscience course, the number of hours in lecture and lab and faculty to student ratios were researched. Lastly, specific neuroscience teaching methods were researched including the percentage of time spent on lectures, textbooks, clinical experience, computer-aided instruction and laboratory.

#### Textbooks

Every school could list an unlimited amount of textbooks that are used in their program. Of the 28 schools who responded to having taught a course specific to neuroscience, eighteen (18) different textbooks were cited as being used. Although a variety of textbooks were used, Guyton & Hall's Textbook of Medical Physiology was by far the book most frequently used. In addition, most programs use more than one text in their course. Table 1 lists the top four books used. All other texts were used by two or fewer schools.

#### Textbooks Used in Neuroscience Courses

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BOOKS	Number	Percent
Guyton & Hall, <u>Textbook of Medical Physiology</u>	16	57%
Cottrell & Smith, <u>Anesthesia and Neurosurgery</u>	5	18%
Barash & Stoelting, <u>Clinical Anesthesia</u>	5	18%
Miller, <u>Anesthesia</u>	3	10%

Table 1.

---

#### Who teaches Neuroscience?

The distribution of the instructors of the 28 schools who taught a neuroscience course is reflected in Figure 2. The CRNA was the most frequently named instructor with 46.4% followed by the neuroscientist

with 28.6%. Anesthesiologists comprised 17.8%, biologists 3.6% and others 3.6%, which included physiologists, anatomists and medical doctors in other specialties.

Bar Chart of Those Responsible for Teaching Neuroscience to  
Nurse Anesthesia Students

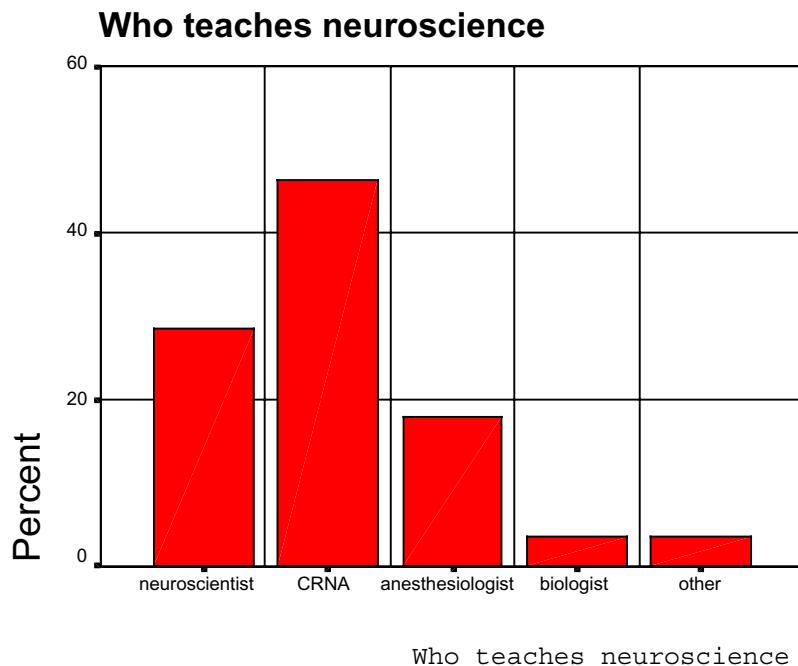


Figure 2.

The total number of respondents (28) were asked if they utilize a laboratory for instruction. Four (4) of the respondents answered yes to using a laboratory dedicated to neuroscience. Three schools did not respond to this question.

The Council on Certification of Nurse Anesthetists (CCNA) assists future candidates in preparing for the certification examination. The council provides a study outline (see Appendix F) representing major topics of concentration. The following tables will reflect specific teaching methodologies of neuroscience that are required studies for the certification examination. The schools were asked to consider five specific methods. The teaching methods researched were textbooks, lectures, computer-aided instruction, clinical learning, laboratory and other. The schools then totaled the amount of time spent on each method for each major topic of study. The mean percentages and the standard deviations (SD) were calculated.

Gross Anatomy of the brain and spinal cord (see Table 2) are taught by textbooks (29%) (SD)=21, lecture (47 %) (SD)=26, computer aided (2.0 %) (SD)=4, clinical (10%) (SD)=9.7, lab (6 %) (SD)=16.65 and other less than 1 percent of the time with the (SD)=1.35.

Table 2.

Gross Anatomy of Brain and Spinal Cord

	Mean %	SD
Textbook	29.46	21.27
Lecture	46.58	26.30
Computer	2.0	4.47
Clinical	9.78	15.80
Lab	6.0	16.65
Other	.18	1.35

Sensory Physiology (see Table 3) was taught by textbooks (35 %) (SD)=22, lectures (49 %) (SD)=25 computers less than (1 %) (SD)=3, clinical instruction (8 %) (SD)=14, laboratory (.91%) (SD)=4 and others (.55%) (SD)=3.

Table 3.

Sensory Physiology

	Mean %	SD
Textbook	34.64	22.19
Lecture	49.22	25.25
Computer	.73	2.62
Clinical	8.51	14.27
Lab	.91	3.98
Other	.55	2.99

Nocioception (see Table 4) was taught by textbooks (33%) (SD)=24, lectures (48%) (SD)=28, computers (1%) (SD)=5, clinical experience (8%) (SD)=14, laboratory (.91%) (SD)=3 and others (.73%) (SD)=3.

Table 4.

Nocioception

	Mean %	SD
Textbook	33.18	23.97
Lecture	48.18	28.34
Computer	1.27	4.74
Clinical	8.09	13.59
Lab	.91	3.48
Other	.73	3.25

Neuromuscular physiology was instructed by textbooks (30%) (SD)=19.61, lectures (51%) (SD)=25, computers (1%) (SD)=3.36, clinical (10%) (SD)=14.48, laboratory (2%) (SD)=5.45 and other less than 1 percent of the time with (SD) of 1.89.

Table 5.

Neuromuscular Physiology

	Mean %	SD
Textbook	29.55	19.61
Lecture	51.13	25.42
Computer	1.27	3.36
Clinical	10.60	14.48
Lab	1.64	5.45
Other	.36	1.89

Electrical Activity of the central nervous system was instructed via textbooks (33%) (SD)=21, lectures (51%) (SD)=26, computers (1%) (SD)=4, clinical experience (8%) (SD)=14, laboratory less than 1 percent, (SD)=3 and other methods (1%) of the time with a (SD) of 7.

Table 6.

Electrical Activity of the CNS

	Mean %	SD
Textbook	33.0	20.79
Lecture	51.09	25.94
Computer	1.18	4.19
Clinical	8.09	13.59
Lab	.64	3.05
Other	1.45	7.31

Neuropharmacology was instructed by textbooks approximately (30%) (SD)=20, lectures (50%) (SD)=27, computers (1%) (SD)=4, clinical experience (10%) (SD)=14, laboratory time less than (1%) (SD)=3 and other (1%) of the time with a (SD)=5.

Table 7.

Neuropharmacology

	Mean %	SD
Textbook	29.76	20.31
Lecture	50.82	27.13
Computer	1.36	3.90
Clinical	9.87	13.78
Lab	.64	3.05
Other	1.45	5.50

Neuropsychiatry was taught by textbooks approximately (35%) (SD)=33, lectures (38%) (SD)=35, clinical (9%) (SD)=20, laboratory (.5%) (SD)=3, computers (.7) (SD)=3, and other (2%) of the time with a (SD)=14.

Table 8.

Neuropsychiatry

	Mean %	SD
Textbook	34.73	33.27
Lecture	38.18	34.65
Computer	.73	2.62
Clinical	8.82	19.77
Lab	.55	2.99
Other	2.0	13.53

Seizure disorders were taught by textbooks (33%) (SD)=24, lectures (43%) (SD)=28, computers (1%) (SD)=3, clinical experience (11%) (SD)=18, laboratory (1%) (SD)=4, and other (2%) (SD)=13.

Table 9.

Seizure Disorders

	Mean %	SD
Textbook	32.82	24.28
Lecture	43.09	27.78
Computer	1.09	3.15
Clinical	10.91	18.46
Lab	1.0	4.45
Other	2.0	13.53

Parkinson s disease was taught by textbooks (32%) (SD)=23, lectures (49%) (SD)=28, computers (1%) (SD)=3, clinical experience (8%) (SD)=13, other (2%) (SD)=14 and laboratory less than 1 percent of the time with a SD of 3.

Table 10.

Parkinson s Disease

	Mean %	SD
Textbook	32.09	23.49
Lecture	48.64	28.37
Computer	1.0	2.95
Clinical	7.62	12.63
Lab	.64	3.05
Other	2.0	13.53

Multiple Sclerosis was taught by textbooks (32%) (SD)=23, lectures (49%) (SD)=28, computers (1%) (SD)=3, clinical experience (7%) (SD)=12, other (2%) (SD)=13, and laboratory less than 1 percent of the time with a SD of 3.

Table 11.

Multiple Sclerosis

	Mean %	SD
Textbook	31.73	23.48
Lecture	49.09	27.62
Computer	1.09	3.15
Clinical	7.36	12.05
Lab	.55	2.99
Other	2.0	13.53

Myasthenia Gravis was instructed by textbooks (34%), lectures (49%), computers (2%), clinical experience (7 %), other (2%) and laboratory less than 1 percent.

Table 12.

Myasthenia Gravis

	Mean %	SD
Textbook	33.73	23.59
Lecture	48.82	26.49
Computer	1.91	6.12
Clinical	6.64	11.18
Lab	.55	2.99
Other	2.0	13.53

Alzheimer s and Dementia was instructed be textbooks (33%) (SD)=28, lectures (42%) (SD)=31, computers (1%) (SD)=3, clinical experience (9%) (SD)=18, other (2%) (SD)=14, and laboratory less than 1 percent of the time with a SD of 3.

Table 13.

Alzheimer s/Dementia

	Mean %	SD
Textbook	33.09	28.16
Lecture	42.00	30.80
Computer	.91	2.90
Clinical	8.73	17.62
Lab	.55	2.99
Other	2.0	13.53

The topic of autonomic hyperreflexia was instructed by textbooks (33%) (SD)=23, lectures (49%) (SD)=27, computers (1%) (SD)=3, clinical experience (7%) (SD)=11, other (2%) (SD)=14 and laboratory less than 1 percent of the time with a SD of 3.

Table 14.

Autonomic Hyperreflexia

	Mean %	SD
Textbook	33.18	23.14
Lecture	49.18	26.65
Computer	.91	2.90
Clinical	7.45	11.42
Lab	.55	2.99
Other	2.41	13.86

Mental disorders and their anesthetic implications were taught by textbooks (35%) (SD)=31, lectures (38%) (SD)=30, computers (1%) (SD)=3, others (2%) (SD)=14 and laboratory (.5%) of the time with an (SD) of 3.

Table 15.

Mental Disorders

	Mean %	SD
Textbook	34.82	30.60
Lecture	37.73	29.84
Computer	.73	2.62
Clinical	9.45	15.45
Lab	.55	2.99
Other	2.18	13.57

Spinal cord injuries were instructed by textbooks (33%) (SD)=23, lecture (50%) (SD)=26, computers (1%) (SD)=4, clinical experience (9%) (SD)=3, laboratory (.55%) and other methods (.74%) with a (SD) of 3.

Table 16.

Spinal Cord Injuries

	Mean %	SD
Textbook	32.91	23.11
Lecture	49.60	26.18
Computer	1.45	4.48
Clinical	8.76	2.99
Lab	.55	2.99
Other	.74	3.28

Cerebral Vascular disease was instructed by textbooks (31%) (SD)=22, lectures (49%) (SD)=26, computers (2%) (SD)=7, clinical experience (10%) (SD)=13, laboratory (.55%) and other methods (1.89) with a (SD) of 2.

Table 17.

Cerebral Vascular Disease

	Mean %	SD
Textbook	31.27	21.93
Lecture	49.09	25.68
Computer	2.18	7.38
Clinical	10.64	13.47
Lab	.55	2.99
Other	.36	1.89

The topic of coma/vegetative states and their anesthetic implications were taught by textbooks (36%) (SD)=8, lectures (44%) (SD)=29, computers (1%) (SD)=3, clinical (9%) (SD)=17, laboratory (.55%) (SD)=3 and other methods (.36%) with a SD of 2.

Table 18.

Coma

	Mean %	SD
Textbook	35.76	27.59
Lecture	43.55	29.26
Computer	.82	2.68
Clinical	9.42	17.22
Lab	.55	2.99
Other	.36	1.89

Table 19.

Importance of Physiologic Systems Relating to Instructing SRNA's

VARIABLES	MEAN	MEDIAN
CARDIOVASCULAR	1.77	2.0
RESPIRATORY	1.88	2.0
NERVOUS SYSTEM	2.05	2.0
RENAL	4.68	5.0
ENDOCRINE	4.68	5.0
MUSCULO-SKELETAL	5.88	5.0
HEMATOLOGY	5.79	6.0
GI	7.06	8.0

The last question asked of the instructors was to rate the importance of physiological systems as they relate to instructing SRNA's. This question was based on a Likert scale with 1 being extremely important and 8 being not at all important. The top three physiologic systems are cardiovascular, respiratory and the nervous system respectively. Table 21 represents the major body systems and how important they were to instructors in teaching student nurse anesthetists.

## Chapter V: SUMMARY

This chapter will provide a summary of the study and recommendations with conclusions from the data analysis.

### Research Question #1

The first research question of this study was How many of the currently accredited nurse anesthesia programs teach a specific course on neuroscience? Question number five on the survey, Do you teach a course specific to neuroscience in your anesthesia program? succinctly answered the question. Twenty-eight (28) schools responded yes . However, one school indicated yes as part of Pathophysiology I. Similarly, another school answered yes combined with the Renal section.

### Research Question #2

The second research question was What are the instructional methods employed to teach neuroscience at the various schools ? This question encompassed those schools who teach a specific course in neuroscience and those schools who teach neuroscience in other courses. For the twenty-eight (28) schools that taught a course specific in neuroscience this question answered what textbooks were used, who teaches the course, hours for lecture, laboratory, faculty to student ratio.

The Council on Certification of Nurse Anesthetists (CCNA) provides an examination content outline to assist prospective candidates in preparing for the certification examination (Appendix F) . Approximately 30% of the examination is related to neuroscience. Section three of the questionnaire asked each program to identify how much of their time was spent teaching those subjects on the CCNA

outline that are related to neuroscience. Specifically, each program was asked to break down how much time was spent on certain teaching methods. The teaching methods included textbooks, lecture, computer-aided instruction, clinical experience, laboratory and others. The total amount of time spent on each of these variables was totaled to 100 percent.

The last question asked the instructors to rate (based on a Likert scale of 1 being most important to 8 being the least important) each physiologic system as they relate to teaching student nurse anesthetists.

The required textbooks varied from school to school. Eighteen (18) different textbooks were used among the schools that teach a course in neuroscience. The most frequently used textbook is Guyton & Halls, Textbook of Medical Physiology (53% of the respondents). Cotrell & Smith, Anesthesia & Neurosurgery and Barash & Stoelting's Clinical Anesthesia tied for the second most used textbooks (17% of the respondents). The remaining textbook was Miller's Anesthesia, which was mentioned by 14% of the respondents. It was interesting to note that all the textbooks mentioned above are general anesthesia textbooks or pathophysiology textbooks. This suggests that some specific neuroscience learning is combined with other courses.

The most frequently mentioned instructor for the neuroscience course was a Certified Registered Nurse Anesthetist (CRNA) with (29%), neuroscientist (14%), anesthesiologist (9%), biologist (2%) and others (2%) which included physiologists, anatomists and medical doctors in other specialties. Many schools mentioned that some subjects were instructed by guest speakers from different specialties.

The majority (82%) of the programs did not use a laboratory while only (17%) stated that they used a laboratory. The scope of this study did not describe how the laboratory time was spent.

The majority of the programs use traditional methods to teach neuroscience. Textbooks were used on the average 35 % of the time teaching neuroscience. Lectures were used on the average 51 % of the time to teach neuroscience. Computer-aided instruction was used approximately 1% of the time to teach neuroscience. Clinical experience accounted for 10% of the instruction time to teach neuroscience. Laboratory time accounted for 1% and other for 2% of the time.

The literature suggests that computers promote an active, self-directed learning environment. Studies as mentioned earlier reported that the use of computer-based instruction resulted in a better mastery of neuroscience. When compared to the previous years scores, students who used computer aided learning scored higher on their examinations. Though computers have shown to enhance the learning of neuroscience very few programs utilize computers in their academic setting. Many of the programs mentioned that they were considering adapting computers into their curriculum within the near future.

Although the programs differ on their teaching methods, the instructors did agree on the importance of learning neuroscience. When the instructors were asked to rate the importance of the body's major physiologic systems ( 1 being extremely important and 8 being not at all important) the mean answer for the Central Nervous System was 2 . Therefore, the issue is not whether it is important to teach neuroscience but how to go about teaching it.

#### Limitations in the Study

As with every study, limitations are to be expected. The first limitation was a response rate of less than 100%, which does not make this an all-inclusive study. The 67% response rate may have left some important information unreported. Most of the respondents were thorough and complete in their answers, however questions at times were left blank which could skew the data.

Other limitations involved questions on who instructed the neuroscience course. Through telephone contact, every effort was made to identify the contact person to complete the survey. Some of the programs had visiting instructors who taught different subjects related to neuroscience. If the program director completed the survey, often time the number of hours spent in the laboratory or classroom was left blank. This would skew the data. Lastly, some of the respondents (5 of 56) were unclear on how to complete the survey so segments were left blank.

#### Conclusions

Neuroscience instruction continues to be an important aspect of teaching SRNA s. Nurse anesthetists manipulate the nervous system every day. Every decision made perioperatively, from technical procedures to medications delivered requires extensive knowledge of the nervous system. The importance of learning neuroscience for the nurse anesthetist is reflected through the required hours determined by the Council of Accreditation of Nurse Anesthesia Educational Programs. The Council on Certification of Nurse Anesthetists expects every student nurse anesthetist to become knowledgeable on the basics of neuroscience. Thirty percent of the certification examination relates

to neuroscience. This study provided a descriptive analysis on how neuroscience is taught in accredited nurse anesthesia programs. There are no studies describing instructional methods in neuroscience for nurse anesthesia programs.

This study showed that there is a great deal of variability in the instruction of neuroscience among various programs. This study does not intend to determine which method is superior but rather allow the availability of information to other programs for instruction that is more consistent.

As an upcoming nurse anesthetist and for the seasoned nurse anesthetists, this study will shed light on the importance of learning neuroscience. Nurse anesthetists are becoming independent practitioners throughout the United States. As independent practitioners, we are expected to continually expand our base of knowledge. As anesthetists, we need to realize the importance of neuroscience to our profession.

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Appendix A.

Content Validity Review

Date \_\_\_\_\_

Dear \_\_\_\_\_,

Attached is a copy of my questionnaire and letter I have developed for my thesis titled Instructional Methods for Neuroscience in Nurse Anesthesia Graduate Programs: A survey of educational Programs .

Your expertise in the education and preparation of nurse anesthetists will be very useful in determining the content validity of my survey. Your input and suggestions will be an important contribution to the success of this survey.

If there are any questions regarding this evaluation please call or E-mail me. My home phone is (301)962-9485 and my E-mail address is msanchez@mxr.usuhs.mil . My mailing address is 12512 Kuhl Road Silver Spring, MD 20902.

Thank you for your time, effort and prompt completion of your assessment .

Michael R. Sanchez, LCDR/USPHS/  
Uniformed Services University of the Health Sciences  
Graduate School of Nursing

APPENDIX B

Initial Letter to Nurse Anesthesia Didactic Coordinators

USUHS  
Graduate School of Nursing  
Nurse Anesthesia Department  
11426 Rockville Pike Suite 400B  
Rockville, MD 20852

LCDR M.R. Sanchez  
Email: msanchez@mrx.usuhs.mil

Date: \_\_\_\_\_

<Title> <First Name>, <Last Name> <Degree>  
<Address 1>  
<Address 2>

Dear <Title> <Last Name>,

I am a Student Registered Nurse Anesthetist at the Graduate School of Nursing at the Uniformed Services University of the Health Sciences. My masters thesis involves describing how neuroscience is incorporated into the curriculum for student nurse anesthetists. I am interested in how other accredited nurse anesthesia programs instruct their students in this area. I would be grateful and appreciative if you could take a few minutes and complete the enclosed questionnaire. Please return it to me within two weeks of receipt in the enclosed self-addressed envelope.

While all returns will be confidential should you wish to receive a copy of the results, please send me a post card with your name and address in a separate mailing. Thank you in advance for your time to complete the questionnaire.

Sincerely,

Michael R. Sanchez, LCDR/USPHS/

APPENDIX C

Letter Accompanying Questionnaire for Test-Retest Participants

Graduate School of Nursing  
Nurse Anesthesia Department  
11426 Rockville Pike Suite 400B  
Rockville, MD 20852

LCDR M.R. Sanchez  
Email: [sanchez@usuhsb.usuhs.mil](mailto:sanchez@usuhsb.usuhs.mil)

<Title> <First Name>, <Last Name> <Degree>

<Address 1>

Dear <Title><Last Name>,

Thank you for your prompt reply to my survey on the instructional methods of neuroscience. I sent the original survey to 17 randomly selected accredited nurse anesthesia schools. I am requesting the first 10 respondents to retake the survey in order to provide supporting evidence for test-retest reliability.

I know how busy a schedule you have and I would greatly appreciate you retaking the survey for this purpose. Your answers will be used to perfect the survey if necessary. Although you are identified by this researcher as one of the schools used for this purpose, your specific answers WILL remain confidential and incorporated with the other respondents. Your contribution to my study is greatly appreciated. Again, thank you in advance for your prompt reply to this request.

Sincerely,

Michael R. Sanchez LCDR/USPHS/

APPENDIX D.

Instructions for questionnaire

Dear Sir/Maam:

The latest Council on Certification of Nurse Anesthetists self evaluation examination (SEE) and certification examination reflects the importance of understanding the neurosciences. Approximately 30-40% of the examinations are related to the understanding of the nervous system. As you well know, nurse anesthetists manipulate the nervous system on a daily basis. Our program is unique in that we are taught two semesters of a course specific to neuroscience. My master's thesis involves describing how other accredited nurse anesthesia programs teach neuroscience. Again, thank you in advance for participating on my study.

The following questionnaire consists of seven sections. Section I is specific for those educational programs that teach a course in Neuroscience. Sections II and III reflect areas of the certification examination specific to neuroscience. In section IV I am interested in how you rate (from 1-8, 1 being the most important and 8 least important) the addressed physiologic topics as they relate to anesthesia. In section V and VI please circle the appropriate teaching methods used to teach the addressed topics and write out the specifics. Finally, in section VII please comment on anything that you feel would assist me in my study.

Respectfully submitted,

Michael R. Sanchez

APPENDIX E:

Survey for Instructors in SRNA Programs

Section I

Demographics:

1. Please circle the Number correlating with the number of students that are enrolled in your program

1= 1 to 10

2= 11 to 20

3= 21 to 30

4= 31 to 40

5= 40 or more

2. Please circle the number that reflects your programs affiliation to an institution:

1=university/university hospital

2=private hospital

3=other (please specify)\_\_\_\_\_

3. Geographic Location:

1= West Coast

2= South/southwest

3= North/Northwest

4= Midwest

5=East/East Coast

4. Instructors: Please specify the number of doctorally prepared, Masters prepared, or MD prepared instructors on the following lines

1=# of Doctorally prepared\_\_\_\_\_

2=# of Masters prepared \_\_\_\_\_

3=# of MD prepared \_\_\_\_\_

4=others (please specify) \_\_\_\_\_

## Section II

### Specific questions related to Neuroscience

5. Do you teach a course specific to Neuroscience in your anesthesia program? (If no,

**Skip to section III**

1=Yes 2=No

6. If Yes, what textbooks do you use? \_\_\_\_\_

7. How many semester/quarter hours is the course? \_\_\_\_\_

A: Number of total hours spent in lecture? \_\_\_\_\_

B: Number of total hours spent in lab? \_\_\_\_\_

8. Who teaches the Neuroscience course? (Circle all that apply)

1=neuroscientist

2=CRNA

3=anesthesiologist

4=biologist

5=Registered Nurse

6= other (please specify)

9. What is the faculty to student ratio for lecture? \_\_\_\_\_

10. Do you utilize a laboratory for instruction? 1=Yes 2=No \_\_\_\_\_

A. If yes, what is your faculty to student ratio \_\_\_\_\_

Section III.

The following content are basic and advanced principles of neuroscience that is tested by the Council on Certification of Nurse Anesthetists (CCNA). We assume that the following content is taught by your accredited program. Please specify in terms of percentage (to a total of 100%) how much time is spent on the following instructional methods. Under each teaching method column, please place the appropriate percentage number.

**For example:**

1=Texts 2=Lectures 3=Computers 4=Clinical 5=Lab 6=other

**A. Gross Anatomy of Brain : 30% 40% 10% 10% 10% 0 =100%**

	1=Texts	2=Lectures	3=Computers	4=Clinical	5=Lab	6=Other	100%
11. Gross Anatomy of the Brain/Spinal cord :							100%
12. Sensory Physiology :							100%
13. Nocioception:							100%
14. Neuromuscular Physiology:							100%
15. Electrical Activity of the CNS							100%
16. Neuropharmacology							100%
17. Neuropsychiatry							100%
18. Seizure Disorders:							100%
19. Parkinson's Disease							100%
20. Multiple Sclerosis							100%
21. Myasthenia Gravis							100%
22. Alzheimers/Dementia							100%
23. Autonomic Hyperreflexia							100%
24. Mental Disorders:							100%
25. Spinal Cord Injuries							100%
26. CVA/Vascular Disease							100%
27. Coma:							100%

**IV. Please rate (from 1-8) the following physiologic systems in order of importance as they relate to instructing SRNA s**

**28.** Gastrointestinal:\_\_\_\_\_ Musculoskeletal:\_\_\_\_\_  
Hematological:\_\_\_\_\_ Central Nervous System:\_\_\_\_\_  
Renal:\_\_\_\_\_ Cardiovascular:\_\_\_\_\_  
Endocrine:\_\_\_\_\_ Respiratory:\_\_\_\_\_

**Section V.**

**29. Please provide any comments you feel would be useful.**

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## APPENDIX F:

## Council of Certification of Nurse Anesthetists Examination

## Content Outline

The following topical outline is provided to assist candidates in preparing for the Certification Examination. It is a guide, which only suggests topics and topical areas to generate and categorize examination questions. It is not all-inclusive, with some elements applying to more than one area. The Council reserves the right to determine examination content, to classify examination questions, and to determine the percentage of test questions from each topical area. The approximate percentages of questions in each major content area are provided below.

## Content Outline

## Percentage of Questions

30%

## I. Basic Sciences

## A. Anatomy, physiology and pathophysiology

1. Cardiovascular
  - a. Arrhythmias
  - b. Ischemic heart disease/angina
  - c. Myocardial infarction
  - d. Hypertension
  - e. Congestive Heart Failure
  - f. Shock

- g. Valvular Heart disease
- h. Cardiomyopathy
- i. Peripheral vascular disease
- j. Pacemaker
- k. Pericardial Tamponade
- 2. Respiratory
  - a. COPD/emphysema/obstructive disease
  - b. Reactive airway conditions/asthma
  - c. Pneumonia
  - d. Tuberculosis
  - e. Pulmonary Embolus
  - f. Cor pulmonale
  - g. Pulmonary hypertension
  - h. Upper respiratory infection
  - i. Sarcoidosis/restrictive disease
  - j. Adult respiratory distress syndrome
  - k. Intra-plueral disease
- 3. Central nervous system
  - a. Seizures
  - b. Vascular lesions
  - c. Hydrocephalus
  - d. Parkinson s
  - e. Multiple Sclerosis
  - f. Myasthenia Gravis
  - g. Alzheimer s/dementia
  - h. Demyelinating disease
  - i. Intracranial hypertension

- j. Autonomic hyperreflexia/Dysfunction
- k. Neuropathy/Myopathy
- l. Coma
- m. Mental disorders
- n. Spinal cord injuries
- 4. Musculoskeletal
  - a. Fractures
  - b. Arthritis
  - c. Muscular dystrophy
  - d. Scoliosis
- 5. Endocrine
  - a. Diabetes Mellitus
  - b. Diabetes Insipidus
  - c. Hypo/hyper thyroid
  - d. Cushing's disease
  - e. Addison's disease
  - f. Pituitary dysfunction
  - g. Pheochromocytoma
  - h. Acromegaly
  - i. Hypo/hyper aldosteronism
- 6. Hepatic
  - a. Hepatitis
  - b. Cirrhosis/portal hypertension
  - c. Hepatic failure
- 7. Renal
  - a. Urolithiasis/kidney stones
  - b. Acute renal failure

- c. Chronic renal failure
- 8. Hematologic
  - a. Anemia
  - b. Sickle cell/hemoglobinopathies
  - c. Polycythemias/leukemias
  - d. AIDS/HIV
  - e. Coagulopathies
- 9. Gastrointestinal
  - a. Ulcer disease
  - b. Ulcerative colitis
  - c. Diaphragmatic hernia
  - d. Hiatal hernia/gastric reflux
  - e. Gallstones/gall bladder disease
  - f. Pancreatitis
  - g. Splenic disorders
  - h. Carcinoid disorders
- 10. Other conditions
  - a. Cancer
  - b. Obesity
  - c. Glaucoma
  - d. Hypothermia
  - e. Hyperthermia
  - f. Major trauma
  - g. Critical Care
  - h. Smoking
  - i. Substance abuse/alcohol and drugs)
  - j. Airway difficulties

- k. Collagen/Lupus erythematosus
- l. Immuno suppression/malnutrition

B. Pharmacology

- 1. General principles
  - a. Pharmacodynamics
  - b. Pharmacokinetics
  - c. Anaphylaxis
  - d. Drug interactions
- 2. Inhalational agents
- 3. Intravenous anesthetics
  - a. Barbituates
  - b. Opioids (agonist/antagonists)
  - c. Benzodiazepines
  - d. Other
- 4. Local Anesthetics
  - a. Esters
  - b. Amides
- 5. Muscle relaxants/antagonists
- 6. Autonomic and cardiovascular drugs
- 7. Others
  - a. Central nervous system drugs
  - b. Diuretics
  - c. Autocoids

5 %

II. Equipment, instrumentation and technology

A. Anesthetic delivery systems

- 1. High/low pressure gas sources

2. Regulators/manifolds
3. Flowmeters, valves, floats
4. Vaporizers
5. Proportioning systems
6. Pressure failure safety devices
7. Fail safe devices
8. Ventilator
9. Carbon dioxide absorbent
10. Anesthetic circuits
11. Pneumatic and electronic alarm devices
12. Flow-over systems
13. Jet ventilation
14. Infusion devices

B. Airway equipment

C. Monitoring devices

1. Central nervous system
  - a. Electroencephalogram
  - b. Evoked potential
  - c. Intracranial pressure
2. Cardiovascular
  - a. Electrocardiogram
  - b. Arterial pressure monitoring
  - c. Noninvasive blood pressure monitoring
  - d. Transesophageal echocardiography
  - e. Central venous pressure monitoring
  - f. Cardiac output
- g. Pulmonary artery pressure monitoring

3. Precordial/esophageal stethoscope/Doppler
4. Respiratory monitoring
  - a. Apnea monitor
  - b. Capnography
  - c. Mass spectrometry
  - d. Pulse oximetry
  - e. Airway pressure
  - f. Respirometer
  - g. Blood gas analysis
5. Peripheral nerve stimulator
6. Renal monitoring
7. Temperature monitoring
8. Maternal/Fetal monitoring devices
9. Others
  - a. Blood warmers
  - b. Warming blankets
  - c. Heat moisture exchanger
  - d. Heated humidifier

31 %

III. Basic principles of anesthesia

- A. Preoperative assessment
- B. Preparation of patient
- C. Positioning of patient
- D. Fluid/Blood replacement
- E. Interpretation of data
  1. Laboratory tests
  2. Diagnostic data

F. Airway management

1. Mask
2. Intubation
3. Cricothyrotomy
4. Fiberoptics

G. Local/Regional anesthesia

1. Infiltration
2. Regional Blocks
  - a. Subarachnoid
  - b. Epidural
  - c. Brachial plexus
  - d. Transtracheal
  - e. IV regional (Bier)
  - f. Retrobulbar/peribulbar
  - g. Ankle
  - h. Digital
  - i. Femoral/sciatic

H. Monitored anesthesia care/conscious sedation

I. Pain management

1. Epidural anesthesia
2. Infiltration nerve blocks
3. Intrathecal narcotics

J. Others

1. Hypotensive techniques
2. Hypothermia
3. Intraoperative wake up tests

K. Post anesthesia care/respiratory therapy

30%

IV. Advanced principles of anesthesia

A. Surgical procedures and procedures related to organ systems

1. Intra abdominal
  - a. Gallbladder
  - b. Liver
  - c. Pancreas
  - d. Spleen
  - e. Stomach
  - f. Renal/Adrenal
  - g. Diaphragm
  - h. Laparoscopy
  - i. Intestine
  - j. Herniorrhaphy
  - k. Bladder
  - l. Abdominal/Gyn
  - m. Prostate
2. Extrathoracic
  - a. Breast Biopsy
  - b. Mastectomy
  - c. Plastic and or reconstructive
  - d. Mediastinoscopy/open lung biopsy
3. Extremities
  - a. Lower
  - b. Upper

- c. Total joint replacements
- 4. Genital and urologic
  - a. Penis/testis
  - b. Transurethral resection
  - c. Cystoscopy
  - d. Dilation/Curretage
  - e. Vaginal hysterectomy
- 5. Head
  - a. Extracranial
    - 1. Cranioplasty
    - 2. Rhizotomy
    - 3. Ear
    - 4. Eye
    - 5. Face
  - 6. Nose
- B. Intracranial
  - 1. Decompression (Burr holes)
  - 2. Space-occupying lesions
  - 3. Vascular
  - 4. Transphenoidal
  - 5. CSF shunts
- C. Oropharyngeal
  - 1. Endoscopy
  - 2. Fractures
  - 3. Tonsils/Adenoids
  - 4. Peritonsillar Abscess
  - 5. Orthodontic/Dental

- 6. Pharynx
- 7. Reconstructive and or plastic
- 6. Intrathoracic
  - a. Heart
  - b. Lung
  - c. Mediastinum
  - d. Diaphragm
  - e. Esophagus
  - f. Thoraco-abdominal
- 7. Neck
  - a. Laryngeal-tracheal
  - b. Parathyroid/Thyroid
  - c. Radical Neck
  - d. Neck tumors
  - e. Plastic and/or reconstruction
- 8. Neuroskeletal
  - a. Laminectomy
  - b. Cervical
  - c. Fusions
  - d. Spinal Cord procedures
  - e. Surgical sympathectomies
- 9. Vascular
  - a. Carotid
  - b. Thoracic
  - c. Abdominal
  - d. Upper extremity
  - e. Lower extremity

f. Porto-systemic shunts

g. Renal artery

10. Diagnostic/therapeutic

a. Venous/arterial

b. Cardioversion

c. CT scan

d. MRI

e. Electroconvulsive therapy

f. Echocardiography

11. Management of complications

12. Other

a. Trauma

b. Burns

c. Critical care support

d. Pacemakers

e. Lithotripsy

f. Organ transplants

g. Laser

B. Pediatrics

1. Anatomy, physiology, pathophysiology

2. Pharmacology

3. Anesthesia techniques

4. Management of complications

C. Obstetrics

1. Anatomy, physiology, pathophysiology

2. Pharmacology

3. Anesthesia techniques/procedures

- 4. Management of complications
- D. Geriatrics
  - 1. Anatomy, physiology, pathophysiology
  - 2. Pharmacology
  - 3. Anesthesia techniques/procedures
  - 4. Management of complications
- 4%
  - V. Professional issues
    - A. Legal
    - B. Quality improvement
    - C. Safety standards (Professional and Organizational)

APPENDIX G

IRB APPROVAL  
MEMORANDUM FOR MICHAEL R. SANCHEZ, GRADUATE SCHOOL OF NURSING

SUBJECT: IRB Review and Approval of Protocol T06172 FOR Human Subject Use

Your research protocol, entitled Instructional Methods for Neuroscience in Nurse Anesthesia Graduate Programs: A survey of Educational Programs, was reviewed and approved for execution on 6/26/98 as an exempt human subject use study under the provisions of 32 CFR 219.101 (b) (1). This approval will be reported to the full IRB, scheduled to meet on 7/9/98.

The IRB understands that this study is designed to describe the way that neuroscience is taught and incorporated into nurse anesthesia curricula at USUHS and elsewhere.

Please notify this office of any amendments or changes in the approved protocol that you might wish to make and any untoward incidents that occur in the conduct of this project. If you have any questions regarding human volunteers, please call me at 301-295-3303.

Michael J. McCreery, Ph.D.

LTC, MS, USA

Director, Research Programs and  
Executive Secretary, IRB

CC: Director, Grants Administration